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TRAINING CIRCULAR
No. 19-1

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON 25, D.C., *10 April 1961*

OPERATION AND EMPLOYMENT, IRRITANT GAS DISPERSERS

SECTION I

INTRODUCTION

1. Purpose and scope. *a.* This training circular provides information and guidance for commanders, staff officers, and all personnel concerned with the utilization of irritant gas dispersers in the control and suppression of disturbances. It covers concepts and techniques for employment of the irritant gas dispersers and provides guidance for the training of operating personnel.

b. Users of this circular are encouraged to submit recommended changes or comments to improve the circular. Comments should be keyed to the specific page, paragraph, and line of the text in which change is recommended. Reasons should be provided for each comment to insure understanding and complete evaluation. Comments should be forwarded direct to The Provost Marshal General, Department of the Army, Washington 25, D.C.

c. The material presented herein is applicable to nuclear and nonnuclear warfare.

2. Concept of employment. The irritant gas dispersers were developed to provide the commanders with a capability for dispersing irritant gases in sufficient quantities to provide effective area coverage under a variety of situations and weather conditions. They are not designed for the direct introduction of an irritant agent into barricaded buildings. Care must also be exercised in their employment in confined areas such as prisoner-of-war camps and against target areas with restricted avenues of escape. Normal usage envisions transport

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of these dispersers by the individual, by ¼-ton or larger vehicles, or by helicopters. When transported on the ground, by individual or by vehicle, the dispersers may be directly integrated into the riot control troop formations or may be operated from a position in direct support thereof. Dispersers mounted in helicopters are used in close conjunction with the riot control troops and in direct implementation of the immediate plan of operations. The exact location of the aircraft, with respect to the troop formation, at the time of release of the irritant agents will be determined by current wind direction and velocity and in some instances by such physical obstacles as may place a restriction on the movements or positioning of the aircraft.

3. Personnel. *a.* Although it is desirable that all unit personnel should have a knowledge of the operation and employment capabilities of the irritant gas dispersers, main reliance in this respect must be placed on specially selected and trained individuals. Such personnel should be chosen for initiative, ability to learn, and proven calmness when faced with large numbers of agitated people.

b. Individuals designated as disperser operators and/or as team members should be well qualified in their primary MOS as members of military police or other units authorized a disperser, and thoroughly trained in riot control operations. Preferably they should have received special training in the use of chemical agents.

4. Chemical agents. *a.* Irritant agents authorized for use in the irritant gas dispersers are CN1 (micropulverized chloroacetophenone), DM1 (micropulverized diphenylaminechloroarsine), CS1 (micropulverized form of the crystalline agent and silica aerogel), or a combination of any two of these agents. For training purposes, technical talc, T1, is used.

b. In selecting the chemical agent to use in a given situation, careful consideration must be given to the effects of each agent. The mob reactions to CN1, DM1, and a combination thereof are generally known. Their reactions to CS1 are not generally known. CS1 is effective in very small concentrations. The effects of CS1 on the eyes and respiratory system are realized in seconds and last from 5 to 10 minutes after the affected individual is exposed to fresh air. Generally, persons reacting to CS1 are incapable of executing organized, concerted actions and excessive exposure to CS1 may render them helpless to vacate the area.

5. Protective clothing. Ordinary field clothing worn with collar and cuffs buttoned and trouser legs tucked into boots, a protective mask, and rubber gloves provide adequate protection for personnel engaged in filling, operating, or transporting the dispersers.

6. Control. Commands are given to the disperser operators by voice or arm and hand signals. Radio communications will normally be required between the troop commander and the commissioned or noncommissioned officer in immediate command of the riot control formation or of the disperser operators.

7. Maintenance. To assure the mechanical reliability of the dispersers, it is necessary that certain specific inspections and maintenance services be performed systematically each time that they are used and that additional services be performed periodically. Because of the corrosive effects of some of the irritant agents to metal, they should not be allowed to remain on the disperser or on the vehicle or helicopter from which operated. Detailed maintenance, inspection, and repair instructions are contained in pertinent technical publications. See the appendix.

8. Precautions. The irritant gas dispersers permit the release of a large quantity of an irritant agent within a very short period of time. Particular care must be exercised at all times, therefore, to assure that an excessive and possibly lethal or completely incapacitating concentration is not developed. In this regard it is essential that the average release rate be determined for each agent and disperser in terms of pounds of the agent expelled per second. The dispersers should not be used to introduce an irritant agent directly into a closed structure except in extreme emergency.

9. Training objectives. Designated personnel are trained in the operation, employment, and maintenance of the respective irritant gas dispersers. They must acquire knowledge and become proficient with respect to—

a. The nomenclature and characteristics of the respective dispersers and the irritant chemical agents.

b. The effects of weather, terrain, and distance on the dissemination of the chemical agents.

c. Methods of operating the dispersers.

d. Techniques which will give greatest assurance of placing an effective concentration on the target area with a minimum concentration on off-target areas.

e. Maintenance of dispersers.

f. Use, care, and inspection of protective clothing.

g. Decontamination of equipment.

h. Safety precautions.

10. Training. *a. Methods of instruction.* Training will be conducted in accordance with the principles set forth in FM 21–5. Practical application will be preceded by thorough preparatory instruction.

b. Specific training.

(1) Practical exercises should be conducted under varying weather conditions and differing riot control situations which will affect the deployment of the dispersers and dispersal techniques. Whenever possible training should be integrated with unit riot control training exercises.

(2) Scheduled drills to test the readiness and operational effectiveness of the operating personnel and equipment should be conducted periodically.

11. Standing operating procedure. SOP should be prepared for the guidance of all disperser operating personnel to include vehicle drivers and helicopter pilots. Included in the SOP should be specific individual duties and actions to be performed preparatory to, during, and after operation of the disperser.

Section II

IRRITANT GAS DISPERSER, SKID-MOUNTED, GED, 5000 CFM, M2

12. Description. The M2 disperser consists essentially of an annular-flow turbine blower powered by an air-cooled, 4-cycle, 8½-horsepower gasoline engine and a hopper that will hold 40 pounds of the powdered agent and deliver it into the air stream which exhausts through an 8-inch diameter stack that can be manually rotated in the direction of the target. The entire assembly is skid-mounted, weighs 500 pounds and is approximately 3 by 5 by 5½ feet in size. The 40 pounds of agent filling may be dispersed in approximately 2 minutes.

13. Transport. Normal usage anticipates placement on a ¾-ton or larger vehicle (fig. 1).

14. Basis of issue. Two per zone of interior army; two per United States Army, Europe; and two per United States Army, Far East.

15. Employment. Generally, principles discussed in section IV and considerations pertinent to the employment of the M4 disperser when mounted on a vehicle are also applicable to the employment of this disperser. The comparative lack of maneuverability of this disperser, however, materially limits the effectiveness of its employment.

16. Operating team. *a. Composition.* Each team should consist of a team commander (commissioned officer), operator (noncommissioned officer), and an assistant operator. Inclusion of the vehicle driver as a regular member of the team is desirable but not mandatory.

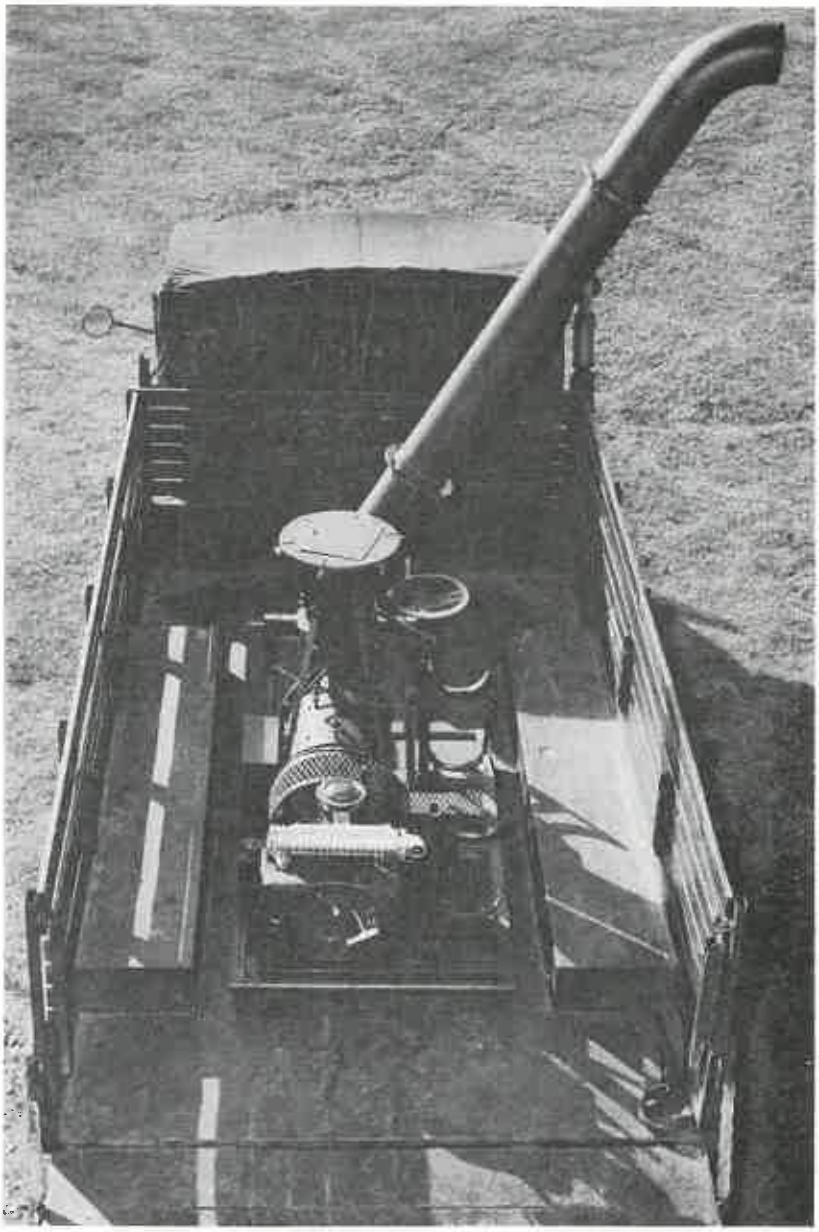

Figure 1. M2 skid-mounted irritant gas disperser on 2½-ton vehicle.

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b. Duties. Duties and responsibilities of the operating team members for this disperser are essentially the same as those of the operating team for the M4 disperser.

SECTION III

IRRITANT GAS DISPERSER, PORTABLE, M3

17. Description. The M3 disperser consists of two tanks, each of which will hold 7½ to 10 pounds of an irritant agent, depending on the type of agent used, a pressure tank assembly, a hose assembly, a pressure regulator, and an M9 portable irritant gas disperser gun. These components are mounted on a tubular steel frame back-pack carrier which provides easy one-man carry of the disperser. The 15 to 20 pound capacity of the agent tanks, depending on the type of agent used, may be dispersed in approximately 25 seconds. The disperser including the agent filling weighs approximately 60 pounds. Also included is an M4 filling hopper for use in filling the two agent tanks. Two pairs of M3 toxicological agent protective rubber gloves for operator protection and necessary tool and service kits complete the M3 disperser assembly.

18. Transport. Normal usage envisions man-carrying of this disperser by an individual on foot (fig. 2) or mounted in a vehicle.

19. Basis of issue. One per MP platoon of all MP units (except division MP units, and TOE's 19–47D, 19–237D, 19–252D, 19–256D,

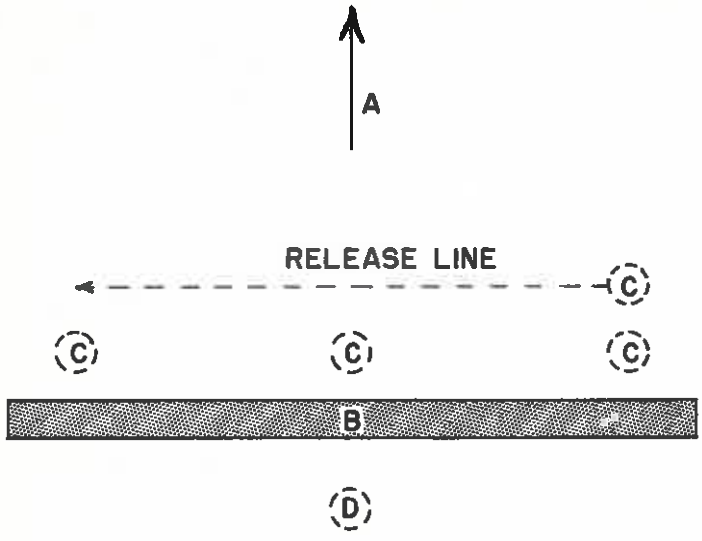
Figure 2. M3 portable irritant gas disperser disseminating talc.

and 19–500D) when authorized by zone of interior army commanders or theater of operations commanders; two per U.S. disciplinary barracks and each branch thereof (TA 19–10); one per platoon of emergency forces (domestic and overseas) having riot control missions (TA); one per Chemical Corps CBR course, DPG; six per The Provost Marshal General's School (TA 19–2); and one per Chemical Corps School. One compressor, reciprocating, power-driven, 3½ CFM, AN–M4, is authorized for each unit authorized one or more dispersers.

20. Employment. *a. General.* The effective use of this disperser is dependent upon a following or slightly quartering wind of a velocity not to exceed 20 m.p.h. Optimum wind velocity is 3 to 5 m.p.h. Normally, the use of this disperser should be backed up by other portable dispersers or by an M2 or M4 disperser inasmuch as repressurizing of the disperser requires the use of a compressor and thereby places the disperser out of action for a period of time, the length of which is dependent upon the location of the compressor and the efficiency of the personnel in reloading and repressurizing operations. By reason of its compactness, portability, and low cost this disperser is well suited as a TOE item of equipment and provides the using units with an immediately available and very effective riot control weapon.

b. Positioning.

(1) *Open area targets.* The portable disperser operator may be positioned in advance of, as a part of, or immediately in the rear of, the riot control formation (fig. 3). Proximity to the mob and the role which the disperser is to play are the determining factors. If the decision has been made to disperse the irritant agent in advance of the close approach of the riot control formation to the mob, the disperser operator may be positioned as a part of or slightly in advance of the formation. This position will permit the operator the greatest freedom in operating the disperser and will assure minimum of exposure by the troops. Freedom to move to firing positions to the right or left of center may assist in the establishment of a more uniform cloud of the agent over the target or will permit, to a limited extent, coverage over selected portions of the target area. If the disperser is to be held in reserve status, the disperser operator should be positioned from one to several feet to the rear of the approximate center of the formation. From this position, the operator can quickly be deployed to the front of the riot control formation to disperse the irritant agent.



LEGEND:

A. WIND DIRECTION.
B. PLATOON LINE.
C. MAN-CARRIED M3 DISPERSER SHOWING SEVERAL ALTERNATE FIRING POSITIONS.
D. RESERVE POSITION.

Figure 3. Release positions for portable disperser operated by individual on foot.

(2) *Closed area targets.* Introduction of an irritant agent into a closed area target, such as a prisoner-of-war compound or enclosure, will normally be effected from a position to the windward and exterior side of the perimeter fence. The riot control formation, on the other hand, should be located at or near the entrance to the compound or enclosure in readiness to enter at the appropriate moment and effect final submission and restore absolute control over all individuals within the affected area. When considered necessary to the submission of individuals barricaded in buildings within the closed area, hand grenades in limited numbers may be used to introduce the agent into the building. Such action should

be accompanied by immediate measures to effect forceable entrance into the building and removal of individuals therefrom as suffocation can result from burning type grenades. Bursting type grenades can cause casualties to personnel within a 5 yard radius.

c. Release point or line. The optimum distance for firing the disperser so as to produce a cloud which will envelop and provide an effective concentration over the largest portion of the target area is primarily dependent upon the wind velocity and the freedom of movement of the operator across the front of the target area. Generally, the distance of the agent release point or line from the target area will range from a minimum of 50 feet to as far as several hundred feet depending on wind velocity. With increasing wind velocity, dissemination of the powdered agent becomes more rapid and the distance between the target area and the point of release must be reduced accordingly if an effective concentration is to be placed on the target.

d. Concentration. Factors affecting the amount of a particular irritant agent required to establish an effective concentration in any given instance or situation are too varied to permit exact guidance. Basic to this very vital aspect of employing irritant agents, however, is a thorough understanding of the effectiveness of the agent used, an awareness of the amount released in a given time, a full appreciation of the makeup and determination of the mob, and close observation of the gas cloud movement over, and its immediate effect on, the mob. Too large a concentration may result in complete incapacitation, serious injuries, and deaths. Too small concentrations, particularly against organized and determined groups, may merely encourage greater violence.

e. Release rate. The M9 portable irritant gas disperser gun permits effective control over the amount of the irritant agent released. Release of the agent may be effected in one continuous burst or in shorter bursts ranging from less than 1 second to several seconds in duration. Knowledge of the amount of the agent released per second is of vital importance in establishing effective but safe concentrations on the target area. The average release rate for talc released in 5-second bursts and under an operating pressure of 70 p.s.i., as determined by two tests with one M3 disperser, was 1.5 pounds per second. Using units are cautioned, however, to determine the particular release rate for each disperser which they operate, both for talc and for each of the irritant agents.

21. Disperser operator. The portable disperser operator works under the immediate control and direction of the riot control formation

commander. Release of the irritant agent should be effected only upon direct order of the commander. If the riot control formation commander is not fully qualified in the characteristics and employment of the irritant agents, a qualified officer should be designated to determine the appropriate time, place, and amount of agent to be released and to issue appropriate commands of execution to the operating personnel.

Section IV

IRRITANT GAS DISPERSER, HELICOPTER OR VEHICLE MOUNTED, M4

22. Description. The M4 disperser basically consists of a sealed hopper that will contain approximately 100 pounds of CS1 or 120 pounds of CN1 or DM1, a pressure tank assembly, a hose assembly, and a pressure regulator. All of these components are supported on a tubular framework so that the complete assembly is approximately 4 by 2½ by 2 feet. An additional component, the M9 portable irritant gas disperser gun, is provided for use with the disperser when it is operated from a ground vehicle. The contents of the hopper, when filled, may be dispersed in approximately 2 minutes. The disperser, including the agent filling, weighs 280 pounds.

23. Transport. The disperser may be mounted on the H19, H34, or HU–1A helicopters or a ¼-ton (fig. 4) or larger vehicle.

Figure 4. M4 irritant gas disperser operated from ¼-ton vehicle.

24. Basis of issue. Four per zone of interior army; four per major oversea command; two per U.S. Army Alaska; two per Military District of Washington; two per The Provost Marshal General's School (TA 19–2); one per Chemical Corps School; and one per Chemical Corps CBR Course, DPG. One compressor, reciprocating, power-driven, 3½ CFM, AN–M4, is authorized for each unit to which an M4 irritant gas disperser is allocated.

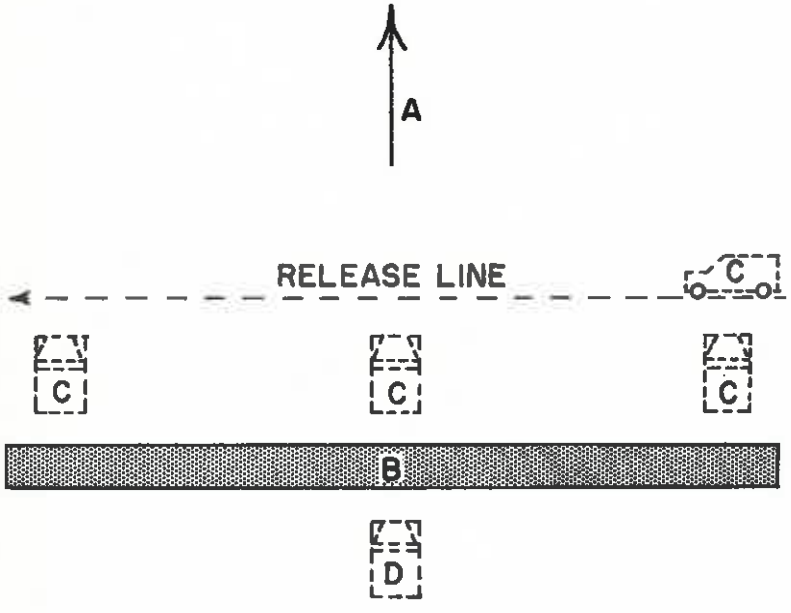
25. Employment. *a. General.* This disperser provides the commander with an air-to-ground dispersal capability when mounted in a helicopter. It is equally suited to mounting in a ¼-ton or larger vehicle. Situations best suited to the employment of this disperser include large scale and determined mob actions requiring dissemination of large quantities of the irritant agent, and conditions under which advantage cannot be taken of a following wind from a ground location.

b. Positioning. When a helicopter is used, release of the irritant agent may be effected from either a hovering position over or to the windward side of the target area or along a line over or to the windward side of the target. When mounted on a vehicle and employed against open area targets, operation of the disperser should normally be effected from positions slightly in advance or as a part of the riot control formation (fig. 5). When employed against closed area targets as discussed in paragraph 20*b*(2), the positioning of the disperser is effected independently of the riot control formation.

c. Release point or line.

(1) *Helicopter mounted.* Release of the irritant agent sufficiently in advance of the riot control formation to permit dissipation of the agent concentration in the target area shortly prior to the arrival of the troop formation is desirable. The actual distance from and location of the release point or line with respect to the target area are determined by the wind velocity and direction and by such physical obstacles as may place a restriction on the movements of the helicopter. Initial release of the irritant agent from a hovering position directly over the target area should be effected in short bursts of 3 to 5 seconds duration. Close observation of the reactions of the mob will permit determination of the required number and length of additional bursts. When a hovering position to the windward side of the target is assumed, the same procedure should be followed except that release of the agent may be effected in bursts of slightly longer duration. When dispersed along a release line, dispersal should begin

in sufficient time to assure cloud coverage over the side of the target area being approached and should be discontinued shortly prior to reaching the far side of the target area to avoid excessive dissemination over other than the target area. The exact moment for beginning and for discontinuing release of the agent will be governed by the rate of speed at which the helicopter is moving, and by the wind velocity and direction.



LEGEND:

A. WIND DIRECTION.
B. PLATOON LINE.
C. VEHICLE MOUNTED M4 DISPERSER SHOWING SEVERAL ALTERNATE FIRING POSITIONS.
D. RESERVE POSITION.

Figure 5. Release positions for M4 disperser operated from a vehicle.

(2) *Vehicle mounted.* Release of the agent may be effected from one or more stationary ground positions or along a line to the windward side of the target area. When released from a stationary point, the agent should be discharged in intermittent bursts while the gun muzzle is swung through an approximate 160° arc to the front. When dispersed along a line, continuous or semicontinuous release may be effected depending upon the irritant agent used, rate of movement, and wind factors.

d. Concentratation. The large amount of the irritant agent contained in this disperser and the rapidity with which it can be released necessitates particular alertness on the part of the operator and responsible commanders to assure that the target area is not covered with an incapacitating concentration. This is particularly true under quiet wind conditions and when the target area is partially enclosed by buildings. Also it should be remembered that 1 pound of CN1 is the equivalent of 10 bursting-type CN grenades, and further that 120 pounds of CN1 (equivalent of 1,200 bursting-type CN grenades) can be dispersed in 2 minutes or less with this disperser.

e. Release rate. When operated from a vehicle, the M9 portable irritant gas disperser gun is also used with the M4 disperser and permits the same close control over the amounts of the agent released. The average release rate of talc, released in 5-second bursts and under an operating pressure of 45 p.s.i., for one M4 disperser tested was found to be 1.2 pounds per second.

26. Operating Team. *a. Composition.* Each team should consist of a team commander (commissioned officer), operator (noncommissioned officer), and assistant operator. Inclusion of the vehicle driver or helicopter pilot as regular members of the team is desirable but not mandatory.

b. Duties.

(1) *Commander.* Supervises operation, employment, and maintenance of the IGD M4. Reconnoiters area to be covered by the dispersed agent and prepares plans for employment. Supervises movement of equipment to site of operation and assigns personnel to specific jobs. Responsible for selection of release point or line and exercises direct control over amount of irritant agent released. Observes and evaluates dispersed agent to assure proper coverage and concentration without interference to mission of troops supported. Instructs or demonstrates operating techniques and procedures. Supervises and conducts team training. Supervises the

the preparation of records and reports related to the maintenance of the disperser's operations.

(2) *Operator and assistant operator.* Responsible for the operation and maintenance of the disperser. Operate and make adjustments to the disperser to obtain optimum quality and quantity of chemical dispersion. Inspect and test-operate defective equipment or components to determine types and causes of malfunction, extent of repairs needed, and quality of repair work performed. Clean and make minor adjustments or replace defective parts using common hand tools. Make final adjustments to equipment to obtain optimum operation. Estimate requirements for maintenance supplies.

APPENDIX

REFERENCES

FM 3–5	Tactics and Techniques of Chemical, Biological, and Radiological (CBR) Warfare.
FM 19–15	Civil Disturbances and Disasters.
FM 21–5	Military Training.
FM 21–40	Small Unit Procedures in Chemical, Biological, and Nuclear Warfare.
FM 21–41	Soldier's Handbook for Nuclear, Biological, and Chemical Warfare.
FM 21–48	Training Exercises and Integrated Training in Chemical, Biological, and Nuclear Warfare.
FM 23–30	Grenades and Pyrotechnics.
TM 3–220	Decontamination.
TM 3–300	Ground Chemical Munitions.
TM 3–304	Protective Clothing and Accessories.
TM 3–1040–201–20P	Organizational Maintenance Repair Parts and Special Tool Lists: Irritant Gas Disperser, Skid-Mounted, GED, 5000 CFM, M2 (FSN 1040–699–5256).
TM 3–2805–200–20P	Organizational Repair Parts and Special Tool Lists: Engine, Gasoline, 2-Cylinder 8.5 HP (FSN 2805–516–5949).
TM 3–522–15	Mask, Protective, Field, M9, and Mask, Protective, Field, M9A1.
TM 3–1040–201–12	Operator and Organizational Maintenance: Irritant Gas Disperser, Skid-Mounted, GED, 5000 CFM, M2.
TM 3–1040–201–35	Field and Depot Maintenance: Irritant Gas Disperser, Skid-Mounted, GED, 5000 CFM, M2.
TM 3–1040–201–35P	Field and Depot Maintenance: Repair Parts Allowances for Irritant Gas Disperser, Skid-Mounted, GED, 5000 CFM, M2 (FSN 1040–699–5256).
TM 3–1040–214–20P	Organizational Maintenance Repair Parts and Special Tool Lists: Irritant Gas Disperser, Portable, M3 (FSN 1040–711–8296).
TM 3–1040–215–20P	Organizational Maintenance Repair Parts and Special Tool Lists: Irritant Gas Disperser, Helicopter or Vehicle Mounted, M4 (FSN 1040–769–9775).

TM 3–2805–200–12	Operator's and Organizational Maintenance: Engine, Gasoline, 2-Cylinder, 8.5 HP (ONAN Model ACK–F/352C).
TM 3–2805–200–35	Field and Depot Maintenance: Engine, Gasoline, 2-Cylinder, 8.5 HP (ONAN Model ACK–F/352C).
TM 3–2805–200–35P	Repair Parts and Special Tool List: Engine, Gasoline, 2-Cylinder (FSN 2805–516–5949).
TM 3–4240–202–15	Operation and Organizational Field and Depot Maintenance: Mask, Protective, Field, M17.
TC 3–9	Use of Agent CS in Training and Riot Control.

BY ORDER OF THE SECRETARY OF THE ARMY:

G. H. DECKER,
General, United States Army,
Chief of Staff.

Official:

R. V. LEE,
Major General, United States Army,
The Adjutant General.

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